AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

AURA Antimicrobial Use and Resistance in Australia

CARAlert THE NATIONAL ALERT SYSTEM FOR CRITICAL ANTIMICROBIAL RESISTANCE

CARAlert data update 9

1 September 2018–30 October 2018

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1. Summary

This data update is one of a series which provides regular updates and six-monthly detailed analyses of data submitted to the National Alert System for Critical Antimicrobial Resistances (CARAlert).

See Appendix 1 for information about CARAlert and its contribution to the Antimicrobial Use and Resistance in Australia (AURA) Surveillance System.

Analyses presented in this update relate to 239 isolates collected from 1 September 2018 to 30 October 2018, where the results were reported to CARAlert by 30 November 2018. From the commencement of CARAlert (17 March 2016) to 30 October 2018, 3,397 results from 95 originating laboratories across Australia were entered into the CARAlert system.

2. Data highlights

Figure 1 and Table 1 show the number and distribution of critical antimicrobial resistance (CAR) isolates, by state and territory.

Compared to the previous two month reporting period, carbapenemase-producing Enterobacterales[1] (CPE) has increased by 39% (*n* = 114), and azithromycin non-susceptible (low-level resistance, MIC ≤ 256 mg/L) *Neisseria gonorrhoeae* has increased by 61% (*n* = 87). The increases in CPE were attributable to an increase in screening isolates compared to the same period in 2017 (*n* = 60 versus *n* = 32). These two resistances were the most commonly reported (81%) of all CARs. The great majority (89%) of reported cases were from New South Wales, Victoria and Queensland.

Figure 2 shows the CARs reported by species and month, 1 September 2018 to 30 October 2018.

Figures 3 to 5 show details of carbapenemase type and the species of CPE, by state and territory, 1 September 2018 to 30 October 2018. IMP (65.8%), NDM (21.9%) and OXA-48-like (8.8%) types accounted for 96.5% of all CPE reported during this period, with 86.8% from New South Wales, Victoria and Queensland. Forty-seven percent of CPE were from clinical specimens, although differences were seen between states and territories. Screening isolates of the CPE NDM type increased to the same period in 2017 (17 versus 10).

Sixteen hospitals had more than two notifications of the same CPE type during this period. These institutions were in New South Wales (*n* = 7), Queensland (*n* = 5), Victoria (*n* = 4), Western Australia (*n* = 1) and the Australian Capital Territory (*n* = 1).

The distribution of azithromycin non-susceptible *N. gonorrhoeae*, by state and territory, is shown in Figure 6. There was one azithromycin non-susceptible (high-level resistance, MIC > 256 mg/L) *N. gonorrhoeae* confirmed in October 2018 from a patient residing in Victoria.

3. Implications of key findings and response

The findings regarding CPE highlight the importance of implementation of the Commission's 2017 CPE control guidelines.

The findings regarding azithromycin non-susceptible *N. gonorrhoeae* highlight the importance of state and territory sexually transmitted infection control and prevention programs.

Each state and territory health department has designated officers who have access to the CARAlert database to enable detailed review of CARs reported for their jurisdiction, including the name of the public hospital where a patient with a confirmed CAR was cared for. This information is able to be used by the states and territories to determine whether infection prevention and control and/or follow-up response action is required.

The Commission has commenced consultation with all states and territories regarding the establishment of a network for coordination of response to outbreaks of resistant organisms in Australia. CARAlert will be one of the data sources to inform this process.

A review of CARs reported to CARAlert was completed in 2018. The review assessed the resistances and species that are currently reported to CARAlert to determine that they continue to be priorities, and identified additional CARs that should be captured by CARAlert.

System changes to accommodate reporting of four new CARs – transferrable resistance to colistin in Enterobacterales, carbapenemase-producing *Acinetobacter baumannii* complex, carbapenemase-producing *Pseudomonas aeruginosa* and *Candida auris* – are expected to be completed so that these can be included early in 2019.

4. Data

Table 1: Number of critical antimicrobial resistance isolates, by state and territory, 1 September 2018 to 30 October 2018

Critical antimicrobial resistance	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	OS	1 September – 30 October			1 January – 30 October		
										2018	2017	Relative change*	2018	2017	Relative change*
Carbapenemase-producing Enterobacterales	36	20	36	4	6	0	1	3	0	106	70	51.4%	475	459	3.5%
Azithromycin non-susceptible (LLR < 256 mg/L) *Neisseria gonorrhoeae*	51	26	7	0	1	0	0	2	0	87	119	-26.9%	444	655	-32.2%
Daptomycin non-susceptible *Staphylococcus aureus*	3	8	3	0	6	0	0	0	0	20	23	-13.0%	101	100	1.0%
Carbapenemase and ribosomal methyltransferase-producing Enterobacterales	0	6	1	0	0	1	0	0	0	8	7	14.3%	23	25	-8.0%
Ceftriaxone non-susceptible *Salmonella* species	1	2	1	0	0	0	0	0	0	4	7	-42.9%	45	29	55.2%
Ribosomal methyltransferase-producing Enterobacterales	0	2	0	0	0	0	0	1	0	3	4	-25.0%	9	18	-50.0%
Multidrug-resistant *Shigella* species	6	0	1	1	0	0	0	0	0	8	6	33.3%	45	17	164.7%
Linezolid non-susceptible *Enterococcus* species	0	0	0	0	0	0	0	1	0	1	1	0.0%	13	4	225.0%
Multidrug-resistant *Mycobacterium tuberculosis*	0	0	1	0	0	0	0	0	0	1	4	-75.0%	18	17	5.9%
Ceftriaxone non-susceptible *Neisseria gonorrhoeae*	0	0	0	0	0	0	0	0	0	0	0	–	2	0	–
Azithromycin non-susceptible (HLR > 256 mg/L) *Neisseria gonorrhoeae*	0	1	0	0	0	0	0	0	0	1	0	–	7	4	75.0%
Ceftriaxone non-susceptible and azithromycin resistant (HLR > 256 mg/L) *Neisseria gonorrhoeae*	0	0	0	0	0	0	0	0	0	0	0	–	2	0	–
Ceftriaxone non-susceptible and azithromycin resistant (LLR < 256 mg/L) *Neisseria gonorrhoeae*	0	0	0	0	0	0	0	0	0	0	0	–	1	0	–
Linezolid non-susceptible *Staphylococcus aureus*	0	0	0	0	0	0	0	0	0	0	1	-100.0%	1	1	0.0%
Total (reported by 30 November 2018)	**97**	**65**	**50**	**5**	**13**	**1**	**1**	**7**	**0**	**239**	**242**	**-1.2%**	**1,186**	**1,329**	**-10.8%**

HLR = high-level resistance; LLR = low-level resistance; OS = overseas; – = not applicable

* Relative change = absolute change between period in 2017 and same period in 2018, expressed as a percentage of 2017 base

Figure 1: Critical antimicrobial resistances (CARs), number and distribution reported nationally, and by state and territory, 1 November 2017 to 30 October 2018

- Carbapenemase-producing Enterobacterales
- Carbapenemase and ribosomal methyltransferase-producing Enterobacterales
- Azithromycin non-susceptible (LLR < 256 mg/L) *Neisseria gonorrhoeae*
- Daptomycin non-susceptible *Staphylococcus aureus*
- Ribosomal methyltransferase-producing Enterobacterales
- Ceftriaxone non-susceptible *Salmonella* species
- Multidrug-resistant *Shigella* species
- Multidrug-resistant *Mycobacterium tuberculosis*
- Linezolid non-susceptible *Enterococcus* species
- Ceftriaxone non-susceptible *Neisseria gonorrhoeae*
- Azithromycin non-susceptible (HLR > 256 mg/L) *Neisseria gonorrhoeae*
- Linezolid non-susceptible *Staphylococcus aureus*
- Ceftriaxone non-susceptible and azithromycin non-susceptible (HLR) *Neisseria gonorrhoeae*
- Ceftriaxone non-susceptible and azithromycin non-susceptible (LLR) *Neisseria gonorrhoeae*

Figure 1 (continued): Critical antimicrobial resistances (CARs), number and distribution reported nationally, and by state and territory, 1 November 2017 to 30 October 2018

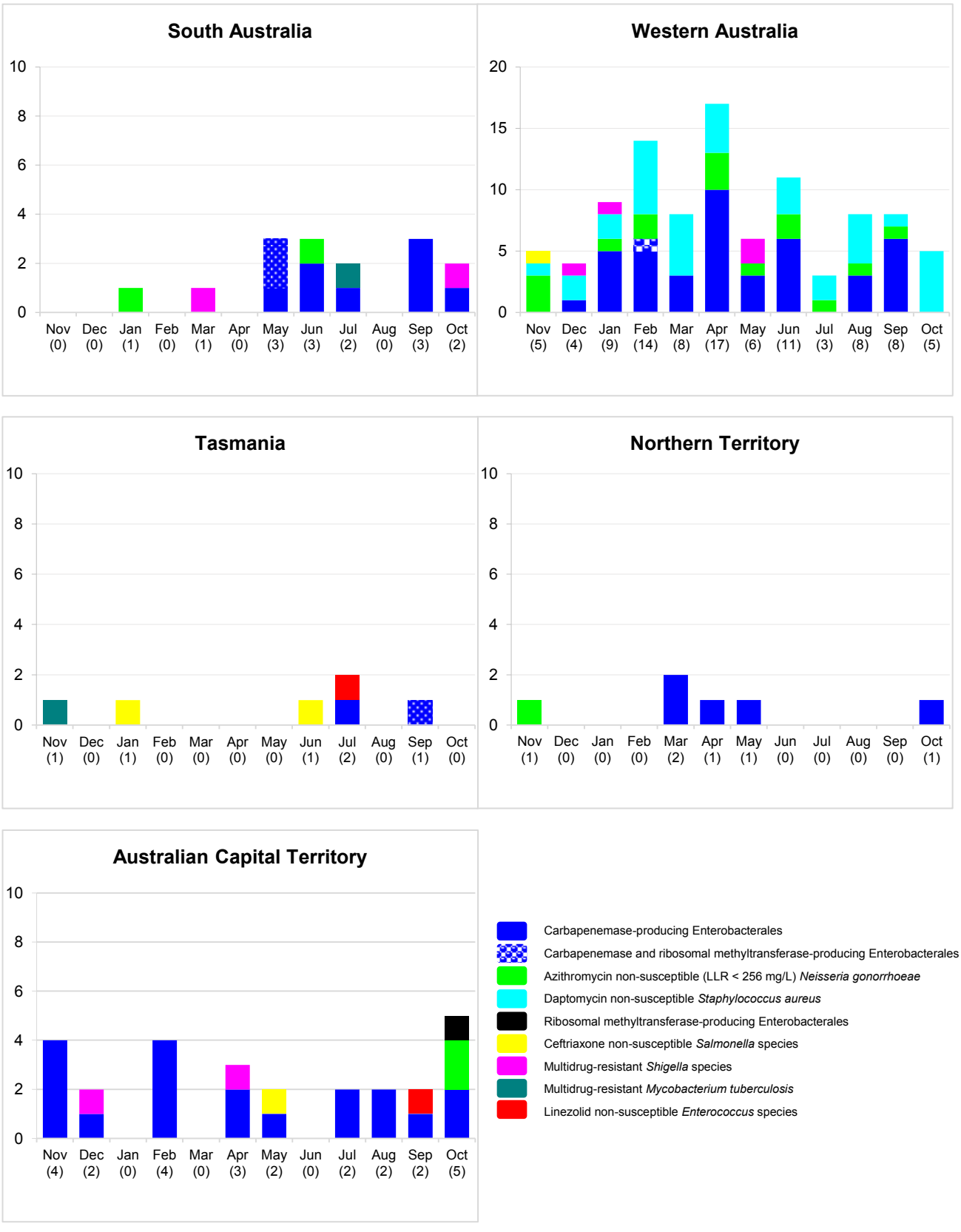


Figure 2: Critical antimicrobial resistances, number reported by species and month, year on year, 1 January 2017 to 30 October 2018

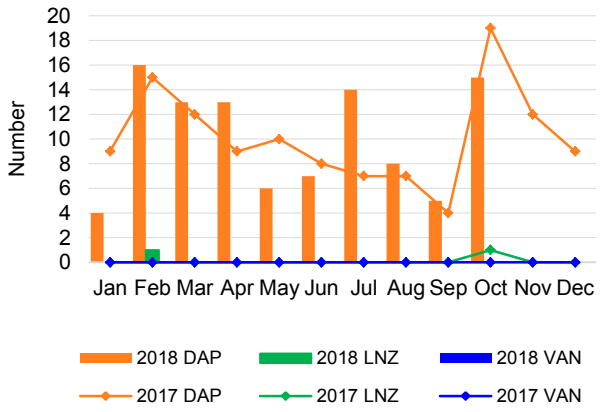
Bars: number of each CAR type reported for each organism for 2018 (January to October)

Lines: number of each CAR type reported for each organism for 2017 (January to December)

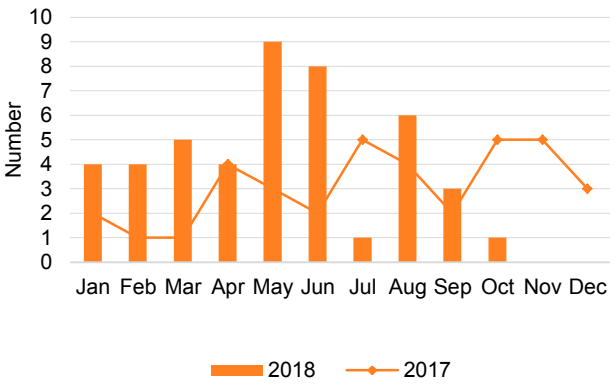
AZI (LLR) = azithromycin non-susceptible, low level resistance (LLR, MIC < 256 mg/L) *Neisseria gonorrhoeae*; AZI (HLR) = HLR =azithromycin non-susceptible, high level resistance (HLR, MIC > 256 mg/L) *Neisseria gonorrhoeae*; CPE =carbapenemase-producing Enterobacterales; CPE+RMT = carbapenemase- and ribosomal methyltransferase-producing Enterobacterales; CTR NGON = ceftriaxone non-susceptible *Neisseria gonorrhoeae*; CTR+AZI (HLR) = ceftriaxone non-susceptible and azithromycin non-susceptible, high level resistance (HLR, MIC > 256 mg/L) *Neisseria gonorrhoeae*; CTR+AZI (LLR) = ceftriaxone non-susceptible and azithromycin non-susceptible, low level resistance (LLR, MIC < 256 mg/L) *Neisseria gonorrhoeae*; RMT = ribosomal methyltransferase-producing Enterobacterales

Figure 2 (continued): Critical antimicrobial resistances, number reported by species and month, year on year, 1 January 2017 to 30 October 2018

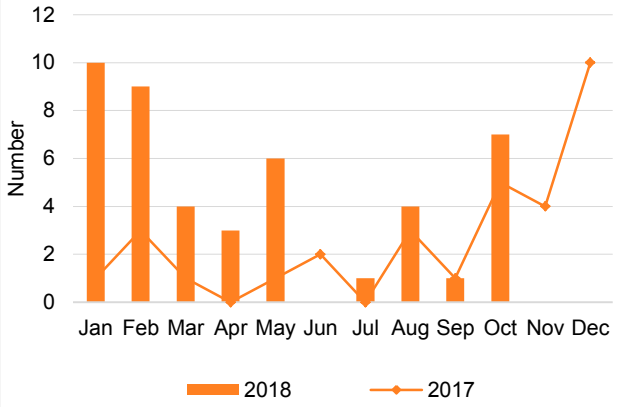
E. *Staphylococcus aureus*



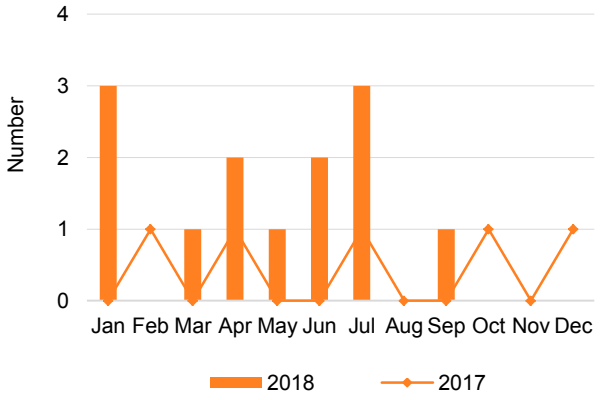
F. *Salmonella* – ceftriaxone non-susceptible



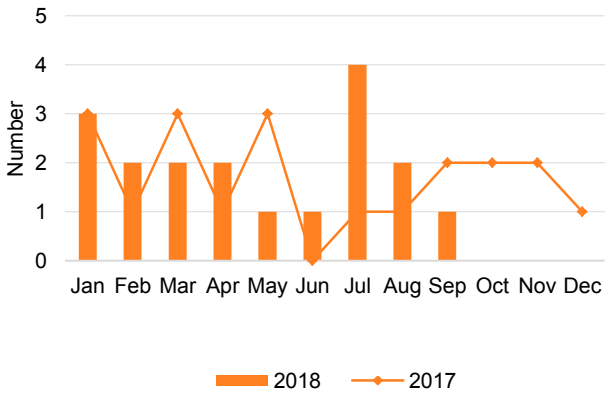
G. *Shigella* – multidrug-resistant



H. *Enterococcus* species – linezolid non-susceptible



I. *Mycobacterium tuberculosis* – multidrug resistant



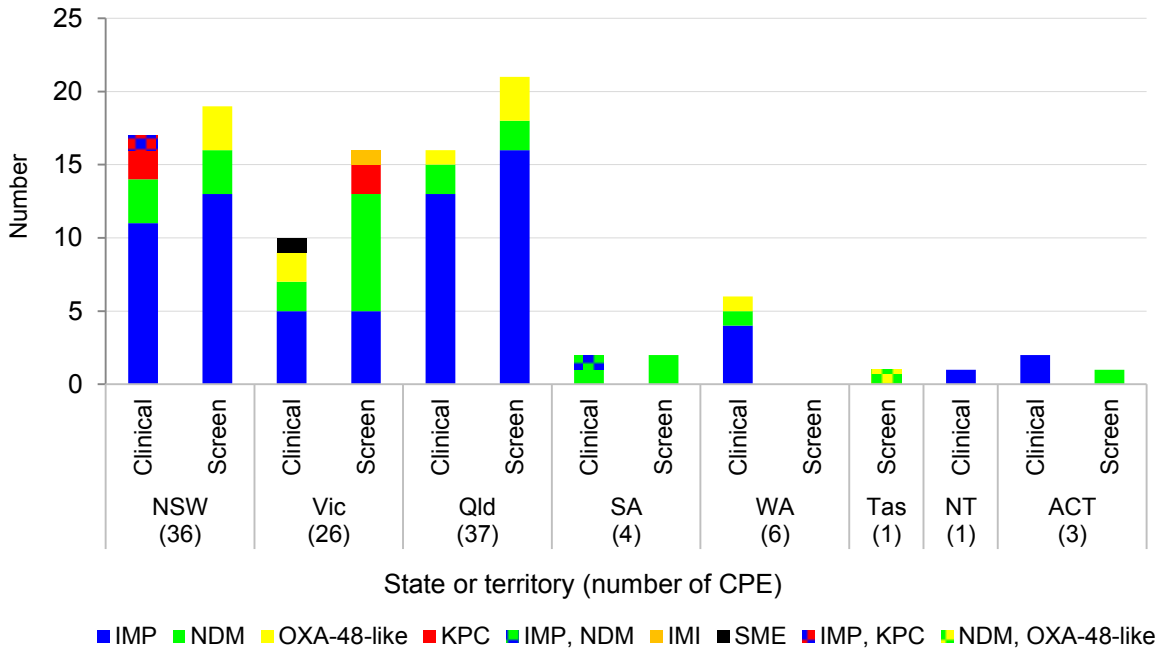
Bars: number of each CAR type reported for each organism for 2018 (January to October)

Lines: number of each CAR type reported for each organism for 2017 (January to December)

DAP = daptomycin non-susceptible *Staphylococcus aureus*; LNZ = linezolid non-susceptible *Staphylococcus aureus*; VAN = vancomycin non-susceptible *Staphylococcus aureus*

5. Carbapenemase-producing Enterobacterales type, by state and territory

Figure 3: Carbapenemase-producing Enterobacterales*, by carbapenemase type and specimen type, number reported by state and territory, 1 September 2018 to 30 October 2018.



* Carbapenemase-producing Enterobacterales (*n* = 106), carbapenemase- and ribosomal methyltransferase-producing Enterobacterales (*n* = 8)

Figure 4: Two–year trend data for the top four carbapenemase types, by state and territory and nationally, 1 July 2016 to 30 October 2018

Type	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Australia
IMP	11 5	8 2	12 7	0 0	4 0	0 0	0 0	3 1	30 20
NDM	4 0	5 1	2 0	1 0	2 0	0 0	1 0	1 0	13 4
OXA-48-like	2 0	5 1	26 0	0 0	1 0	0 0	0 0	0 0	29 2
KPC	1 0	3 0	0 0	0 0	0 0	0 0	0 0	0 0	4 1
All types	16 7	18 8	38 8	2 0	6 1	1 0	1 0	3 1	75 31

Line graphs represent three-month moving average for the period 1 July 2016 to 30 October 2018, for each type, where maximum monthly average was greater than one.

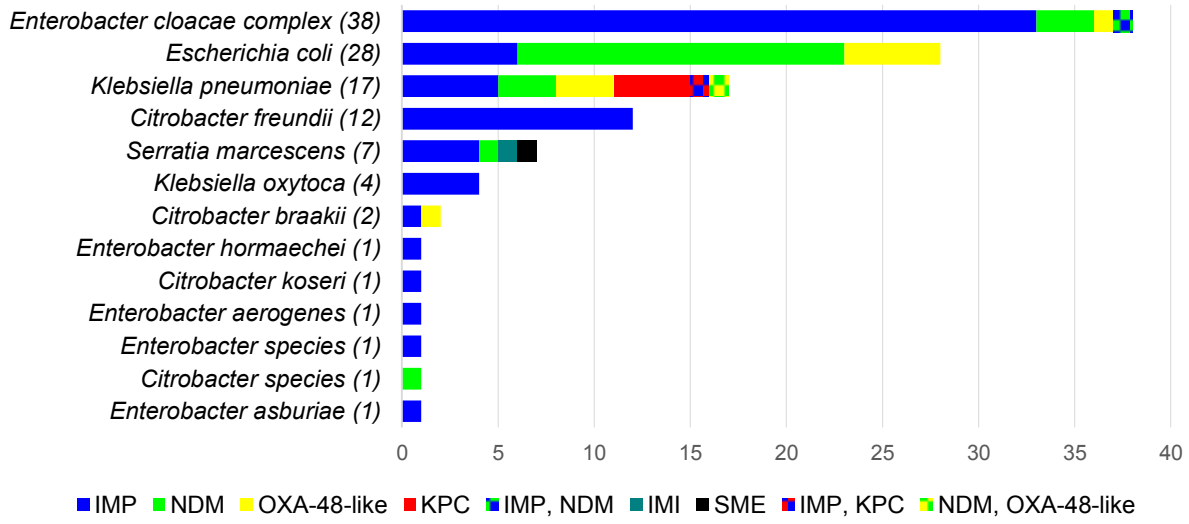
Straight line in cell = no carbapenemase type for that state or territory during the reporting period

Blank cell = maximum monthly average was one or less

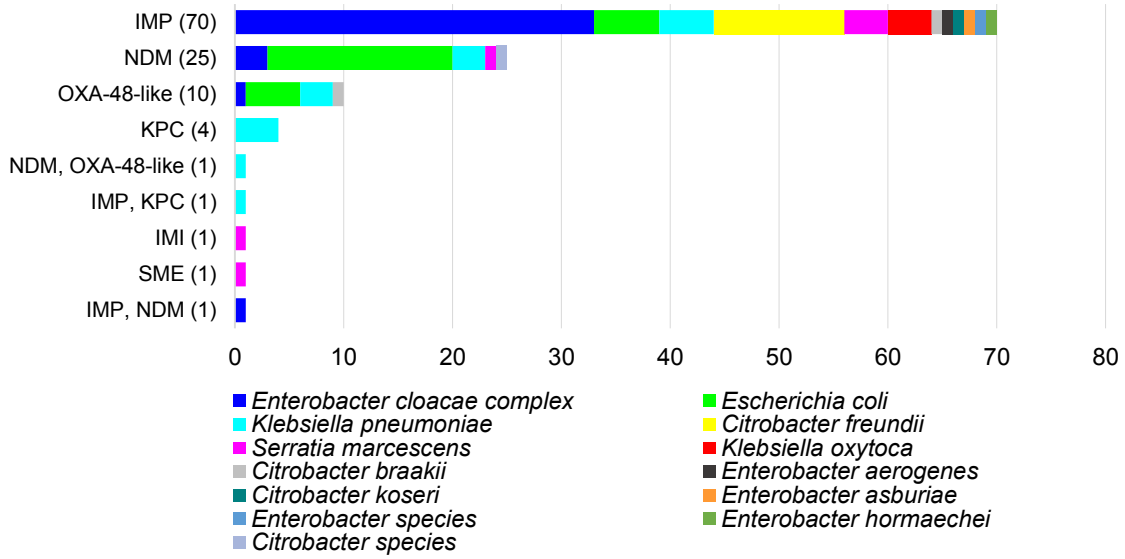
6. Carbapenemase-producing Enterobacterales by species and carbapenemase type

Figure 5: Carbapenemase-producing Enterobacterales, number reported by (A) species and (B) carbapenemase type, 1 September 2018 and 30 October 2018.

A. Species (*n*) by carbapenemase type



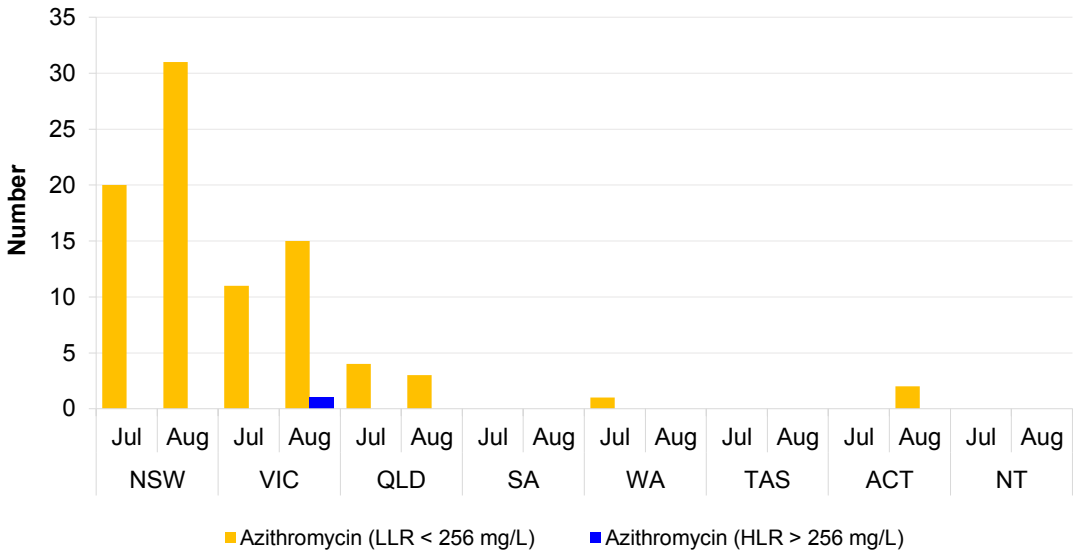
B. Carbapenemase type (*n*) by species



* Carbapenemase-producing Enterobacterales (*n* = 106), carbapenemase- and ribosomal methyltransferase-producing Enterobacterales (*n* = 8)

Neisseria gonorrhoeae by state and territory

Figure 6: *Neisseria gonorrhoeae*, number reported by state and territory, and month of collection*, 1 September 2018 and 30 October 2018.



* Where state and territory of residence is unknown, the state of the originating laboratory has been assigned

About CARAlert

CARAlert is a key component of the Antimicrobial Use and Resistance in Australia (AURA) Surveillance System. CARAlert was established by the Australian Commission on Safety and Quality in Health Care (the Commission) in March 2016.

The AURA Surveillance System, coordinated by the Commission, provides essential information to develop and implement strategies to prevent and contain antimicrobial resistance (AMR) in human health and improve antimicrobial use across the acute and community healthcare settings. AURA also supports the National Safety and Quality Health Service (NSQHS) Standard Preventing and Controlling Healthcare-Associated Infection and Australia's National Antimicrobial Resistance Strategy (2015–2019). Funding for AURA is provided by the Australian Government Department of Health and state and territory health departments.

Critical antimicrobial resistances (CARs) are resistance mechanisms known to be a serious threat to the effectiveness of last-line antimicrobial agents. CARs can result in significant morbidity and mortality.

The CARs reported under CARAlert are listed in Table 2. The CARs were drawn from the list of high-priority organisms and antimicrobials which are the focus of the AURA Surveillance System.[1]

Table 2: List of critical antimicrobial resistances reported to CARAlert

Species	Critical Resistance
Enterobacterales	Carbapenemase-producing, and/or ribosomal methyltransferase-producing
Enterococcus species	Linezolid non-susceptible
Mycobacterium tuberculosis	Multidrug-resistant – resistant to at least rifampicin and isoniazid
Neisseria gonorrhoeae	Ceftriaxone or azithromycin non-susceptible
Salmonella species	Ceftriaxone non-susceptible
Shigella species	Multidrug-resistant
Staphylococcus aureus	Vancomycin, linezolid or daptomycin non-susceptible
Streptococcus pyogenes	Penicillin reduced susceptibility

Note: Enterobacterales (new taxonomy)

[1] Australian Commission on Safety and Quality in Health Care (ACSQHC). AURA 2017: Second Australian report on antimicrobial use and resistance in human health. Sydney: ACSQHC; 2017.

The CARAlert system is based on the following routine processes used by pathology laboratories for identifying and confirming potential CARs:

- Collection and routine testing – the isolate is collected from the patient and sent to the originating laboratory for routine testing
- Confirmation – if the originating laboratory suspects that the isolate is a CAR, it sends the isolate to a confirming laboratory that has the capacity to confirm the CAR
- Submission to the CARAlert system – the confirming laboratory advises the originating laboratory of the result of the test, and the originating laboratory reports back to the health service that cared for the patient from whom the specimen was collected; the confirming laboratory then submits the details of the resistance and organism into the secure CARAlert web portal.

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